DOCUMENT RESUME

ED 333 337 CS 010 594

AUTHOR Iovino, Suzanne F.

TITLE The Effect of Dominant Hemispheric Processing Modes and Notetaking Strategy on the Comprehension and Retention of Academically Underprepared College Readers.

PUB DATE Nov 89

NOTE 34p.; Paper presented at the Annual Meeting of the College Reading Association (33rd, Philadelphia, PA, November 3-5, 1989).

PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.

DESCRIPTORS Basic Skills; *Brain Hemisphere Functions; *College Students; Higher Education; Learning Strategies; *Notetaking; *Outlining (Discourse); *Reading Comprehension; Reading Research; Retention (Psychology); *Study Skills

IDENTIFIERS Delaware State College; *Graphic Organizers

ABSTRACT

A study determined the effect of outlining and networking on college students' comprehension and retention of expository text, and examined the individual difference of preferred dominant hemispheric mode for its effect and interaction with the notetaking strategy. Subjects, 98 students enrolled in a required study skills course at Delaware State College, were divided into three groups. Five hours of instruction in outlining were given to one experimental group, while the other experimental group received instruction in networking, a form of graphic organizer. The third group constituted a control group as it received no textbook notetaking instruction. Each group was given a 20-item pretest, posttest, and retention test. Results indicated that: (1) all groups achieved statistically significant improved scores; (2) the outlining group produced a t-score of paired means double that of the other groups; (3) the drop in scores from the post- to retention test was statistically significant for the outlining and control group, but the networking group's score did not vary in a statistically significant way; and (3) the interaction between the treatment groups and the dominant hemispheric modes was not statistically significant with regards to posttest scores but was statistically significant with respect to the retention test scores. Findings suggest that outlining significantly aided academically underprepared college readers to achieve greater comprehension on the immediate recall test than did the networking strategy, although networking significantly improved students' ability to retain information over time. (Two figures and seven tables of data are included; 49 references are attached.) (Author/RS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED333337

TITLE: THE EFFECT OF DOMINANT HEMISPHERIC PROCESSING MODES AND NOTETAKING STRATEGY ON THE COMPREHENSION AND RETENTION OF ACADEMICALLY UNDERPREPARED COLLEGE READERS

AUTHOR: Suzanne F. Iovino, Ed.D.

AFFILIATION: Delaware State College
Dover, Delaware

POSITION: Assistant Professor of Reading
Learning Skills Center, Director

Paper Presented at: College Reading Association Conference
November 3-5, 1989

BEST COPY AVAILABLE

as0105s94

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Suzanne F. Iovino

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ABSTRACT

This study was undertaken to determine the effect of outlining and networking on college students' comprehension and retention of expository text. Furthermore, the individual difference of preferred dominant hemispheric mode was examined for its effect and interaction with the notetaking strategy.

Ninety-eight students attending a four-year college who scored below the local and national median on the STEP Series II: Reading Subtest comprised the population for this study. They registered for a required study skills course and were divided into three treatment groups. Five hours of instruction were given to one experimental group in outlining and the other experimental group received instruction in networking, a form of graphic organizer. The third group constituted a control group as it received no textbook notetaking instruction but rather received a unit of study in memory techniques and introduction to library research. Each group was given a 20-item pretest, posttest, and retention test on an expository text selection.

Findings indicate that the gain scores from pre-to-post tests for all three treatment groups showed statistically significant improved scores. The outlining group, however, produced a a t score of paired means doubled that of the other groups. The drop in scores from the post-to- retention test was statistically significant for the outlining and control group, but the networking group's score did not vary in a statistically significant way. The interaction between the treatment groups and the domi-

nant hemispheric modes was not statistically significant with regards to post test scores but was statistically significant ($p<.046$) with respect to the retention test scores.

Thus, outlining significantly aided academically underprepared college readers to achieve greater comprehension on the immediate recall test than did the networking strategy. However, networking significantly improved students' ability to retain information over time.

INTRODUCTION

Basic skill deficiencies in reading can create great barriers to a college student faced with courses emphasizing independent learning through textbook reading. Recent advances in cognitive psychology indicate that effective learning requires active, strategic management of the study process (Anderson, Spiro, & Montague, 1977; Brown and Campione, 1978; Wittrock, 1974). Developmental programs on the college level focus on helping their students develop metacognition, i.e. knowledge and control of one's own thinking and learning activities (Brown 1980, 1982) so that they can become independent learners.

One component of typical study skill courses for academically underprepared college readers is a unit on textbook reading and notetaking strategies. The purpose of such instruction is to improve comprehension through active involvement with text and enhanced retention by effectively organizing the ideas to be

learned. It has been demonstrated that in order for a textbook reading/notetaking strategy to be effective for a student, one must understand the value of it (Brown & Smiley, 1978), be competent in using it, adjust it to the criterial task to be administered, and have it complement the characteristic of the learner (Brown, 1982, p.43).

PURPOSE

Given the constraints of time, a textbook reading and notetaking unit, which provides for both review of theory and practice, will typically span approximately three weeks of a semester (nine classroom hours).Answers to the following questions precipitated the need for this study: 1)Can students really learn to apply an unfamiliar strategy in such a short time period? 2)Can a positive change in comprehension and retention of text material be affected? 3) What strategies do our students apply at the onset of the instructional unit? 4) Because notetaking strategies are time-consuming, will the students be able to apply them in a limited time frame for testing purposes? 5) Will one style of notetaking work better for right-brained or left-brained individuals?

REVIEW OF THE LITERATURE

The two primary textbook notetaking strategies included in study skill courses are outlining and graphic organizers. Little

research attention has been paid to outlining since Barton's (1930) study with high school students. In Barton's (1930) study 96 high school students were taught to skim paragraphs for main ideas and supporting details while deleting information of a trivial nature. Students who outlined scored significantly higher on tests in Barton's study than a matched control group who were taught without the accompanying outline strategy. The procedure Barton used to teach outlining closely paralleled Kintsch and van Dijk's macrorules applied in recent studies teaching summarization (Bean & al., 1983). Similarly, Salisbury (1935) used 30 class sessions to teach outlining and summarizing to seventh, ninth and twelfth grade English students. When compared with control subjects receiving no training, the trained subjects demonstrated significant gains in both reading and reasoning ability on standardized achievement tests.

In more recent studies comparing outlining to other strategies, outlining was found to be no more effective (Arnold, 1942; Stordahl & Christensen, 1956; Todd & Kessler, 1971; Willmore, 1966 as cited in Anderson & Armbruster, 1984). These four studies, however, did not include an instructional phase as did the studies done by Barton and Salisbury.

Bean, Singer, Sorter, & Frazee (1983) reported that a query of 58 average and above average 10th graders mentioned only outlining and rereading as procedures they used to study world history. On the other hand, Goetz and Palmer (1984) reported that out of 224 college students in a study skills course each could name at least eight strategies that could be identified as

appropriate to use when preparing for a test covering a reading passage; yet in reality they chose rereading eighty percent of the time. Fewer than twenty percent reported actually formulating questions, listing major words, writing summaries, or outlining.

The literature discusses the concept of graphic organizers under many different names, such as structured overviews, story mapping, networking, webbing, patterning, ideational scaffolding, and flowcharting. Ausubel's (1968) theory of cognitive readiness and Barron's (1969) structured overview, a graphic representation of key vocabulary arranged to show the relationship between new and previously learned concepts, worked together to improve learning from text. Although graphic organizers can be used effectively as a prereading, during, post-reading, and evaluation activity, this study examined the impact of a student generated visual diagram of concepts comprehended while reading a selection;these are called "graphic post organizers"(Barron & Stone, 1974).

Networking, a spatial learning strategy devised by a research group from Texas Christian University, was selected for this study because it labels the relationships between ideas by using six characteristic linking labels. By labeling the functions (T - type, P - part of, L- leads to or results in, A- like, C-characteristics, and E-evidence of), students are required to deeply process the ideas and pay close attention to text structure. Holley, Dansereau, Collins, McDonald, & Garland (1979) found that five and one-half hours of networking training produced superior recall of main ideas over the control group and

that the process was more effective for students with low GPA's than for students with high GPA'S.

In a study with deaf students who experienced great difficulty extracting main ideas from texts, dealing with complex syntax and who also had low levels of vocabulary, a significant improvement ($p<.01$) was realized on tasks requiring identification of main ideas, answering detailed, factual questions and judging importance of clauses presented in triads (Long & Aldersley, 1984, p.116). Long and Aldersley (1984) believed that other student populations with language deficiencies may also benefit from applying the strategy.

Cerebral dominance or hemispheric preference has to do with the relationship between the two hemispheres of the brain and the preference of either the left or right hemisphere to direct the body's behavior (Matthews, 1982). Blakeslee states that "significant differences in learning style and functioning are almost entirely a result of different training during childhood" (1980, p. 7). The amount of environmental stimulation develops either sensitivity to cognitive or affective thought. McLendon (1982) reports that lateralization of brain function develops over time but is complete by puberty.

The left brain hemisphere controls the right side of the body and processes information through rational, sequential and analytic procedures. It deals with information described as being linear, verbal, and explicit (Matthews, 1982). The right brain hemisphere is the seat of our emotions, intuitions, and creativity. It controls the left side of the body and special-

izes in simultaneous, holistic, visual, spatial, synthetic, metaphonic and appositional operations. The right brained individual gathers information more effectively through affective channels (Ornstein, 1972).

The list of right-brained characteristics read like a poor report card. They include being unorganized, losing track of time, exhibiting difficulties in reading and completing tasks, being impulsive, having frequent mood changes, experiencing common word reversals and having difficulty interpreting verbal directions. Integration of both hemispheres allows for higher achievement levels (Konicek, 1975; Rennels, 1976; Matthews, 1982; Rubenzer, 1982).

Outlining is a very linear and sequential type of information processing. Matthews (1982) cites outlining to be a left-brain activity. A left brain individual would tend to think "in words" (Dunn & al., 1982) and the outlining process would inductively make sense. On the other hand, graphic organizers delineate visually the progression of major details to minor points and should be viewed as a right-brained activity due to its visual, holistic approach (Luvaas-Briggs, 1984). Since a right-brained student who tends to think "in pictures" is far more comfortable with the deductive reasoning process, the sole use of the outlining strategy would be forcing this student to think "backwards" (Dunn & al., 1982).

SUBJECTS

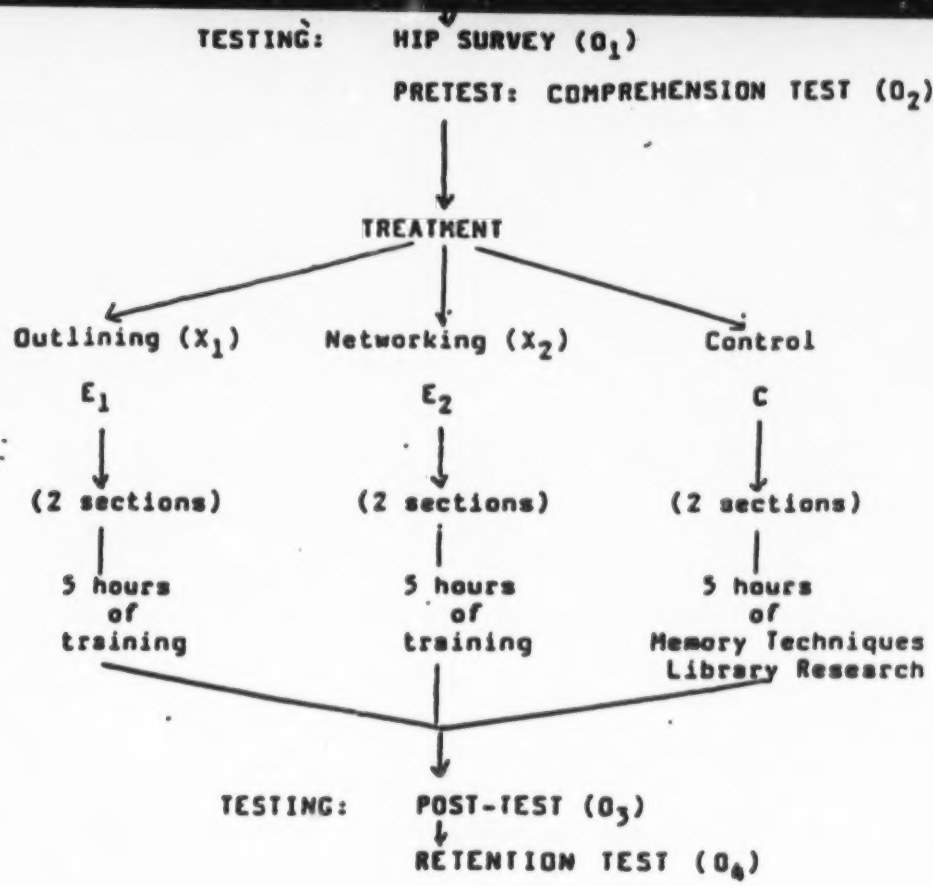
Ninety-eight academically underprepared college readers enrolled in six study skill classes at Delaware State College comprised the sample. The subjects were administered the Sequential Test of Education Progress (STEP) Series II: Reading Subtest upon admittance. Their scores fell below the local and national median; thus they were required to take a course sequence of reading lab and study skills. The mean age of the subjects was 18.5 years with an ethnic origin comprised of 92% black, 5% white, 2% Hispanic, and 1% other. The mean high school GPA was 2.32. The subjects contained more left-brained dominant individuals and far fewer right-brained dominant individuals than were present in the normed population of adults. The number of integrated dominant mode subjects was not significantly different from the normed population.

DESIGN

This study used the Nonequivalent Control Group Design (Campbell & Stanley, 1963, p. 47) which allowed for the study of intact classrooms. The study spanned three weeks with nine class sessions of fifty minute duration or six class sessions of seventy-five minutes depending on the course meeting times. The time devoted to both testing and instructional phases was consistent for all groups. Because the experimental and control groups consisted of students from the same population who were recruited

into the respective class sections via one common registration procedure, the establishment of the control group was considered highly reliable (Campbell & Stanley, 1963,p.48) and threats to internal validity minimized.

To control intrasession conditions this study randomly assigned section numbers to the status of experimental and control groups; participating instructors were randomly assigned to experimental or control groups; and due to subjects selecting course times on an individual basis for a variety of reasons, systematic bias should have been minimal. The following diagram illustrates the design of this investigation.



Where:

E_1, E_2 = Experimental groups consisting of academically underprepared readers with left, right or integrated dominant hemispheric processing modes

C = Control Group of academically underprepared readers with left, right or integrated dominant hemispheric processing modes

X = Independent Variable (Notetaking Strategies)

X_1 = Outlining Instruction

X_2 = Networking Instruction

O_1 = Human Information Processing (HIP) Survey (Categorizes students according to dominant processing mode)

O_2 = Pretest comprehension score

O_3 = Post- Test Comprehension Score

O_4 = Retention Scores on one week delayed readministered Post test.

BEST COPY AVAILABLE

MATERIALS

This study used two standardized tests and one textbook chapter excerpt accompanied by a comprehension test developed by the researcher. The first standardized test, the Sequential test of Educational Progress (STEP) Series II: Reading Subtest, is used by the college at large to screen their incoming students and identify any students who have deficiencies in reading. It is published by CTB McGraw-Hill and consists of a 30-item, 15 minute vocabulary test and a 30-item, 30 minutes comprehension test which yield one single reading score utilizing raw scores and stanines.

The second standardized instrument, The Human Information Processing (HIP) Survey, assesses an individual in terms of dominant hemispheric processing style. The instrument was developed in 1976 at the University of Georgia by Paul Torrance and others under the original title of Your Style of Learning and Thinking (SOLAT). In 1984 it was published under the trademark Hip Survey by Scholastic Testing Service, Inc. It "consists of a 40-item multiple choice inventory of styles of learning and thinking derived from research and theory concerning specialized functions of the right and left hemispheres of the brain" (Matthews, 1982, p.12).

The excerpt, "Human Needs", was selected as the expository reading material upon which the pre-, post- and retention tests would focus. This article, containing 1200-1300 words, was

written by David J. Rachman and Michael H. Mescon. It was originally published by Random House in a 1976 issue of Business Today and reprinted in 1980 by the Houghton Mifflin Company as part of the text, Reading Skills for College Study, written by James F. Shepherd. The article was appropriate due to its organizational structure depicting expository text, its readability level measuring 11-12th grade, and its content typical of a topic covered in a college curriculum.

Twenty comprehension questions were developed. They included questions aimed at main ideas, details, examples and understanding vocabulary in the excerpt. The same twenty questions were randomly reordered to create the post test and reordered again to form the delayed retention test. A panel of experts was gathered to determine whether the questions effectively examined the content of the excerpt. Upon final approval of the experts, the test was considered to have content validity.

The reliability of the pre- and post-test comprehension instruments was determined by the test- retest method and the split-half method. Four English 101 sections were asked to read the chapter excerpt and prepare themselves to answer multiple choice question on the content without referring back to the excerpt. Six weeks later the students were asked to repeat the process on the same chapter excerpt in order to establish the reliability estimate of the instrument. The correlation coefficient on the sixty-two (62) students who took both the test and retest measures was +.712. An $r = \pm.70$ to ±1.00 is considered a high to very high relationship (Van Dalen, 1979, p.324). The split half procedure was employed using the initial test scores

of eighty-one students. Due to the small number of items, the Spearman-Brown prophecy formula was used. As predicted by Van Dalen (1979), the results of this procedure produced a somewhat inflated value of r (-.78) as compared to the test-retest procedure. Since both results fell in the range of a high relationship, the instrument demonstrated reliability.

PROCEDURE

The students registering in six available study skill sections during the Fall semester became the subjects for this study. The three study skill instructors on staff, which included the researcher, participated in the study. Each was assigned two section numbers prior to the registration period. By random draw, each instructor was assigned one of the following treatment strategies to be used in both her sections: outlining, networking, or control (library research and memory techniques).

On the first day the students were briefed on the study and indicated their willingness to participate by signing a consent form. The Hip Survey was administered to each section. It was read aloud to minimize any reading deficits that may have been present in the group. Both raw scores and percentile scores were calculated for each student's right, integrated and left responses. The mode with the highest percentile became the student's dominant mode.

During the second class session each instructor discussed the concept of hemispheric dominance and how the knowledge of

one's own dominant mode could be used to improve a student's knowledge of him/herself and its impact on studying. A filmstrip, Using Your Creative Brain, was shown in each class to enable a common base of knowledge. The Hip Survey results were shared with each student.

At the next class session the excerpt "Human Needs" was distributed . The students were required to spend a minimum of twenty five minutes reading and studying, any way they chose, the content of the excerpt. They were told that following the 25-35 minute study period they would be required to answer twenty multiple choice questions testing the main ideas and details presented in the excerpt without having access to the excerpt. The excerpt and any notes they may have compiled while studying were collected, and the students were given fifteen minutes to take a paper and pencil test consisting of twenty items, each of multiple choice format with four possible answers.

The answer sheets were collected and scored on the basis of raw scores from 1 to 20. The general classification of notetaking format that each student applied while studying the pretest excerpt was tabulated under the following general classifications: 1) no notes taken, (2) underlining of text, (3) margin notes, (4) outlining.

Class sessions four through nine in combination with homework assignments provided training and application exercises in outlining, networking, and memory techniques and library research. The training sessions agenda follows:

Training Sessions Agenda

Networking Group

Session 4: A general introduction to networking
Training on the links & structure names
Practice on networking sentences
Overview of networking as a notetaking strategy

Session 5: Training on selecting key words or idea units in paragraphs
Network several passages with modeling
Practice labeling functions working with signal words

Session 6: Complete with partners skeletal networks of practice passages
Discuss organizational patterns of text
Study distinct Networking patterns that reflect different organizational patterns
Predict test questions based on networks

Session 7: Network an excerpt entitled "Intelligence"
Practice margin notes and marking skills
Write up test questions on cards from network notes

Session 8: Network a regular text chapter. Teacher assistance available
Summarize concepts in networks done by yourself and others
Learn to monitor your comprehension through questioning strategies

Session 9: Network alone a passage between 500-1000 words.
Predict test questions on the diagram content.
Compare your network with others done in class.
Practice recitation of ideas in network.
Take a set of researcher made questions on the passage.

Control Group

Session 4: Discuss Physiological Process of Memory
neurons, choline, lecithin
Effect of Nutrition on Memory

Session 5: Types of Memory
Visual, Auditory, Kinesthetic
Discuss the Principles of Memory
Intent to Remember
Meaningfulness
Spaced Study
Categorization & Labeling
Association
Mnemonic Devices

Session 6: Discuss application of organization to materials to be learned
Whole method
Magical 7 Theory
Word Groups
Categorizing using memory tags

Session 7: Practice using mnemonic devices on information to be learned.
Acronyms, Acrostics, Rhymes
Association Techniques
Use of Imagery-Visualization

Session 8: Memory Games to Improve Memory
Discussion of need to enforce environmental conditioning when studying
Concentration Techniques - Use of Baroque Music, Breathing Techniques, Distraction Avoidance, Focusing

Session 9: Library Research Orientation

Outlining Group

Session 4: Introduction of outlining format
Practice categorization at superordinate and subordinate labels

Session 5: Surveying text material for superordinate labels and subordinate labels
Selecting key words and phrases from text
Organizing key words and phrases

Session 6: Identifying supporting details in paragraphs and placing them in the proper outline format
Completing skeletal outlines from paragraph reading

Session 7: Group discussion of homework assignment
Continued practice completing skeletal outlines from passages

Session 8: Generate key word outlines from passages
Predict test questions from top level labels
Outline of text chapter 14
Compare similarities and differences of student outlines with the group

Session 9: Outline independently a longer passage.
Predict test questions.
Answer comprehension questions.
Compare outline detail to questions

BEST COPY AVAILABLE

Following the training sessions, a class session was devoted to the post-test, a task of reading and studying the excerpt of "Human Needs" for a minimum of 25-35 minutes. Again the students were informed they would be taking a multiple choice test without referring back to the excerpt. All notes were collected along with the excerpt before administering the questions.

One week later the retention test was administered to all the experimental and control subjects. They did not reread the excerpt but were allowed fifteen minutes for answering the questions within which time all the subjects had finished. At no time during the study was discussion entertained on the "Human Needs" excerpt or comprehension question.

RESULTS

From the notes the students compiled while studying the pre-test, the majority of the students in all three treatment groups used an underlining approach to studying the excerpt information. None of the subjects applied the networking (graphic organizer) approach while studying. Table 4.1 reflects the pre- and post-test notetaking strategy used by the students in the three treatment groups.

Table 4.1

Notetaking Strategies Applied By Students
During Pre-test and Post-test

Strategy	Control		Networking		Outlining	
	Pre-	Post	Pre-	Post	Pre-	Post
No Notes	4	8	4	0	8	1
Underlining of text	18	16	24	6	25	15
Margin Notes in text	5	3	1	0	2	0
Outlining	2	3	10	1	11	35
Networking	0	0	0	36	0	0

The descriptive data including the STEP scores, age, high school GPA and pre-test score as presented in Table 4.2 was analyzed to identify whether the treatment groups were homogeneous. The results of the analysis of variance presented in Table 4.3 determined that none of the F values approached 3.111 and therefore, the population was homogeneously grouped. The high similarity between the experimental and treatment groups allows for more effective control over the main effects of history, maturation, testing, and instrumentation.

TABLE 4.2

Summary of Descriptive Data
on Four Characteristic Variables
By Treatment Groups

Group	Factor	STEP	AGE	H.S.GPA	PRETEST
Outlining	Mean	445.944	18.553	2.411	12.158
	SD	7.272	1.140	.679	3.074
	Var.	52.886	1.300	.461	9.449
Networking	Mean	446.059	18.235	2.529	12.206
	SD	7.573	1.002	.545	3.123
	Var.	57.349	1.003	.97	9.752
Control	Mean	445.520	18.846	2.320	11.846
	SD	5.728	2.125	.554	2.143
	Var.	32.810	4.515	.307	4.592
Total	Mean	445.779	18.520	2.427	12.09
	SD	6.831	1.451	.608	2.88
	Var.	46.656	2.107	.370	8.29

Table 4.3

Summary of Analysis of Variance Table
on the Four Characteristics Variables

VARIABLE	SOURCE	DF	SUM of SQUARES	MEAN SQUARE	F	p
STEP:	BET. GROUP	2	4.473	2.236	.044	.957
	WITHIN GROUP	92	4674.011	50.804		
AGE:	BET. GROUP	2	5.562	2.781	1.315	.272
	WITHIN GROUP	95	200.897	2.115		
H.S. GPA:	BET. GROUP	2	.609	.305	.810	.548
	WITHIN GROUP	87	32.712	.376		
PRETEST:	BET. GROUP	2	2.177	1.089	.128	.880
	WITHIN GROUP	95	809.996	8.526		

There were no significant differences ($p<.05$) between the mean scores for the outlining, networking and control groups on both the immediate recall and retention tests. Additionally, there were no significant differences between the mean scores of students with different dominant hemispheric preference modes on both the immediate recall and retention tests.

Table 4.4

Group Means on Pre-, Post- & Retention Tests

Groups	Factor	Pretest	Post	Retention
Outlining	N	38	38	38
	$\bar{X}$	12.16	14.76	13.82
	SD	3.07	2.51	2.83
Networking	N	34	34	34
	$\bar{X}$	12.21	13.56	13.24
	SD	3.12	3.52	2.86
Control	N	26	26	26
	$\bar{X}$	11.85	13.04	12.35
	SD	2.14	2.78	2.83

T-test analysis of group scores of gains made between pre-test and post-test are presented in Table 4.5. All three treatment groups made significant gains; however, the outlining treat-

ment group produced a t score of 5.890 which more than doubled that of the other two treatment groups. This indicates that outlining was more effective in producing significant gains in comprehension on an immediate recall test.

A negative movement in score was expected to occur between the post-test activity and the delayed one week retention test. The t-test produced significant differences between the post and retention scores for the outlining and control groups. However, the networking group produced a t score of 0.0892, which was lower than the required t score for .05 alpha. This nonsignificant loss in retention demonstrates the power in this textbook reading/notetaking strategy.

Table 4.5

T-Test Analysis of Group Scores

Pre/Post Gains
Post/Retention Losses

Group	Factor	Pre/ Post Gains	Post/ Retention Losses	Required t score for .05 alpha
Outlining	t	5.890***	2.649**	1.687
	df	37	37	
Networking	t	2.567**	0.892	1.694
	df	33	33	
Control	t	2.160**	2.031*	1.708
	df	25	25	

* p<.05
** p<.025
*** p<.005

The effect of the learner's dominant hemispheric mode on comprehension when using a particular strategy was explored. Out of the sample of 98 subjects, 37 were integrated(equally using right and left-brained preferences), 44 were left-brained dominant, and 17 were right-brained dominant. This sample did varysignificantly from the normative data reported for the Hip Survey. There were significantly more left-brained dominant students in this sample population than existed in the normative population of 324 adults of all ages. Also, there were significantly less right-brained students in the sample than were found in the normative data population. However, the number of integrated students did not vary significantly from the normative population.

The integrated group as a whole achieved the highest mean score. The highest mean score on the Post-test (15.579) was achieved by the outlining/integrated group. The lowest mean score (11.0) on the post-test was generated by the networking/right dominant group. A two-way ANOVA (Table 4.6) showed no significant interaction ($p<.123$) for treatment method by hemispheric dominance on the post-test scores. This lack of significance indicates that one strategy is not more suited to the needs of a particular dominant mode than another. The two-way analysis of variance showed a marginally significant interaction ($p=.046$) for treatment method by hemispheric dominance on the retention scores (Table 4.7) Using the pretest as a covariate to control for prior knowledge, the two way interaction between treatment and dominance resulted in a nonsignificant $F = 1.825$, $p = 131$. This

indicates that the differences are most probably attributable to the prior knowledge of the students.

Table 4.6

Two Way Analysis of Variance

Post-Test Scores by Treatment/Dominance

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARES	F	p
DOMINANCE	2	34.277	17.139	2.004	0.139
TREATMENT	2	41.840	20.920	2.446	0.090
INTERACTION	4	49.877	12.469	1.458	0.221
RESIDUAL	89	761.114	8.552		
TOTAL	97	887.108			

Table 4.7

Two Way Analysis of Variance
Retention Test Scores by Treatment/Dominance

Source of Variation	DF	Sum of Squares	Mean Squares	F	Significance of F
Dominance	2	22.612	11.306	1.518	0.223
Treatment	2	21.988	10.994	1.416	0.233
Interaction	4	75.088	18.772	2.520	0.046
Residual	89	663.053	7.450		
Total	97	782.741			

DISCUSSION

Since all groups experienced significant gains in post-test scores, instruction in outlining, networking, and even memory techniques, as was given to the control groups, aids student comprehension of expository text. Closer examination of the pre/post test gains indicate that the students in the outlining group actually doubled the gains realized by the other two groups. This reaffirms the early studies by Barton (1930) and Salisbury (1935) which had reported the significant effect outlining had on improving comprehension. Because of the inclusion of an instructional segment in this study, the results do not support more recent studies reporting no advantage of outlining over other strategies (Arnold, 1942; Stordahl & Christiansen, 1956; Todd & Kessler, 1971; Willmore, 1966 as cited in Anderson & Armbruster, 1984).

Academically underprepared college readers in all three treatment groups demonstrated significant increases in comprehension following five hours of instruction time. Therefore, short training programs with college students in textbook reading/note-taking and even memory strategies can have a significant impact on improving their performance levels. All subjects in this study had prior outlining instruction during their high school years and displayed a range of capabilities from poor to very good at the onset of this study.

These same subjects demonstrated their ability to learn and

apply the technique of networking to expository text within the five hours of allotted instructional time. Since none of these students had previously been exposed to networking, the findings of this study lend credence to the research of Dansereau (1984) that reported significant increases in comprehension following five and one-half to seven hours of training. Therefore, when remediating students at the college level, the length of required instructional time on such strategies as outlining and networking need not be excessive before benefits in student performance are realized.

The note-taking strategy of networking enabled academically underprepared college readers to retain significantly more information over a one-week period than the outlining strategy. This study reaffirmed Peters (1975) conclusion that poor comprehenders as well as good comprehenders can benefit significantly from learning to identify key structural words and depict them in a diagram format. The retention advantage displayed in this study strengthens the argument proposed by Buckley and Boyle (1981) that such visual diagraming of ideas is a powerful aid to recall.

The formation of notes in either the outlining or networking format while study-reading did not require the expenditure of significant additional time. Anderson and Armbruster (1984)cited the time-consuming characteristics of using both outlining and graphic post-organizers as study strategies. However, this study confirmed Vaughn's (1978) study with college students that the additional task of notetaking did not require significant additional time. Students in this study were required to spend a minimum of twenty-five minutes studying the excerpt and all

subjects completed notes on the reading within thirty-five minutes. In addition some students also underlined the excerpt in combination with another strategy. The study procedures appeared to be a way students focused in on the written material and restructured it as part of a learning process when given a time goal for completion.

The literature on hemispheric dominance and its impact on learning style encourages teachers to become brain-wise (Dunn & al., 1982; Tipps & al.,1982). The educator dealing with academically underprepared college students can easily see many similarities between them and the characteristics of right-brained individuals. It may be wondered whether this population of students is comprised of a majority of individuals with a preference for right-brained thinking who have not found the educational system compatible due to its emphasis on left-brained skills. The fact that this sample of academically underprepared readers had significantly fewer right -brained individuals did not support such a theory. It also limited the generalizability of the observations and very probably contributed to a significant interaction ($p<.046$) between the treatment of notetaking instruction and hemispheric dominance on the retention scores of students.

The left-brained students who according to Matthews (1982) and Dunn & al. (1982) would prefer to think inductively and would be more comfortable using a linear, analytical approach did well, on the contrary, using the networking approach. There were eight left-dominant students above the mean in the networking group and six at or below the post-test mean. Yet in the outlin-

ing group, five left-brained students, who were predicted to find this strategy compatible, scored above the mean while nine scored at or below the post-test mean.

The right-brained students were predicted by Matthews (1982) and Dunn & al. (1982) to prefer using a holistic, visual strategy. And yet, three out of the four right-brained students in the outlining group scored above the mean on the post-test with one of those subjects outscoring all other students in the group. In the networking group six out of the seven right-brained students scored at or below the mean on the post-test. These limited observations do not bear out the anticipated trend of Dunn's theory.

The data from this study does not add support for the contention that matching strategy characteristics with preferred dominance characteristics is the solution to improved academic performance. It does seem to suggest that there may be a need for complementing one's preferred hemispheric thinking mode with a notetaking strategy that builds on a different organizational approach and assists in accomplishing the integration of ideas in their minds.

Given the observed advantages from using both outlining and networking, it is recommended that programs designed to assist the academically underprepared college reader incorporate training sessions in both strategies. To limit instruction to only one strategy would deny the student an approach that may enable him/her to more effectively process text ideas. Although hemispheric preference did not play a significant role in determining successful and efficient use of a notetaking strategy, it is

recommended that study skill courses incorporate awareness of the right and left brain characteristics into their curriculum. The students in this study gained insight into some personal characteristics that led to some metacognitive growth.

References

Anderson, R.C., Spiro, R.J., and Montague, W.E. (Eds.). (1977). Schooling and the acquisition of knowledge. Hillsdale, NJ: Erlbaum.

Anderson, Thomas H. and Armbruster, Bonnie B. (1984). Studying. In P. David Pearson (Ed.) Handbook of reading research. New York: Longman.

Ausubel, David. (1968). Educational psychology: a cognitive view. New York: Holt, Rinehart and Winston.

Barron, R. F. (1969). The use of vocabulary as an advance organizer. In Harold L. Herber & Peter L. Sanders (Eds.), Research in reading in the content areas: first year report. Syracuse, N.Y: Syracuse University Press.

Barron, R.F. and Stone, V.F. (1974). The effect of student-constructed graphic post organizers upon learning vocabulary relationships. In P.L. Macke (Ed.) Interaction: research and practice for college adult reading. National Reading Conference Yearbook, 23, Clemson, S.C.: National Reading Conference.

Barton, W.A., Jr. (1930). Outlining as a study procedure. New York: Columbia University Bureau of Publications.

Bean, T.W., Singer, H., Sorter, J. and Frazee, C. (1983). Acquisition of summarization rules as a basis for question generation in learning from expository text at the high school level. In Jerome A. Niles (Ed.), Searches for meaning in reading/language processing and instruction. Thirty-Second Yearbook on the National Reading Conference. Blacksburg, Va: Virginia Polytechnic Institute and State University.

Blakeslee, T.R. (1980). The right brain. Garden City, NY: Anchor Press/Doubleday.

Brown, A.L. (1980). Metacognitive development and reading. In R.J. Spiro, B.C. Bruce & W.F. Brewer (Eds.), Theoretical issues in reading comprehension. Hillsdale, NJ: Erlbaum.

Brown, A.L. (1982). Learning how to learn from reading. In J.A. Langer & M.T. Smith-Burke (Eds.) Reader meets author/bridging the gap. Newark, De: International Reading Association.

Brown, A.L. and Campione, J.C. (1978). Permissable inferences from the outcome of training studies in cognitive development research. Quarterly Newsletter of the Institute for Comparative Human Development, 2, 46-53.

Brown, A.L., Campione, J.C., Day, J.D. (1981). Learning to learn: on training students to learn from texts.

Educational Researcher, 10 (2), 14-21.

Brown, A.L. and Smiley, S. (1978). The development of strategies for studying texts. Child Development, 49 (4), 1076-1088.

Buckley, Marilyn Hanf and Boyle, Owen. (1981). Mapping the writing journal. California University: Berkley School of Education. (ERIC Document Reproduction Service No. ED 225 191)

Campbell, D.T. and Stanley, J.C. (1963). Experimental and quasi-experimental designs for research. Hopewell, NJ: Houghton, Mifflin Co.

Dunn, Rita; Cavanaugh, David P.; Eberle, Betty M.; Zenhausern, Robert. (1982) Hemispheric preference: the newest element of learning style. The American Biology Teacher, 44 (5), 291-294.

Goetz, Ernest T. and Palmer, Douglas J. (1984). The role of students' perceptions of study strategy and personal attributes in strategy use. (ERIC Document Reproduction Service No. 243 077)

Holley, Charles D. and Dansereau, Donald F. (1984). Networking: the technique and empirical evidence. In C.D. Holley and D.F. Dansereau (Eds.), Spatial learning strategies: techniques, applications and related issues. New York: Academic Press.

Holley, C.D., Dansereau, D.F., McDonald, B.A., Garland, J.C. & Collins, K.W. (1979). Evaluation of a hierarchical mapping technique as an aid to prose processing.

Contemporary Educational Psychology, 4, 227-237.

Huard, S.D. (1983). The effect of graphic post organizer training on learning from text. Unpublished doctoral dissertation. University of Connecticut.

Konicek, Richard D. (1975). Seeking synergism for man's two -hemisphere brain. Phi Delta Kappan, 57 (1), 37-39.

Long, Gary and Aldersley, Stephen. (1984). Networking: application with hearing-impaired students. In C.D. Holley and D.F. Dansereau (Eds.), Spatial learning strategies: techniques, applications and related issues. New York: Academic Press.

Luvaas-Briggs, Linda. (1984). Some "whole brain" activities for the community college reading class. Journal of Reading, 27 (7), 644-64.

Matthews, D.B. (1982). Cerebral dominance: it's use in understanding learning styles and behavioral patterns. Detroit, Mi: American Personnel and Guidance Annual Convention. (ERIC Document Reproduction Service No. 218 559)

McLendon, Gloria H. (1982). Exploring the research concerning left hemisphere/right hemisphere cognitive processes and examining one instructional technique which may be implemented across the curriculum to produce holistic thinkers. (ERIC Document Reproduction Service No. 223 541)

Moore, David W. and Readence, John E. (1984). A quantitative and qualitative review of graphic organizer research.

The Journal of Educational Research, 78, 1, 11-17.

Ornstein, Robert E. 1972). The mind field. New York: Viking Press.

Peters, Charles. (1975-76). The effects of systematic restructuring of material upon the comprehension process. Reading Research Quarterly, 97-111.

Rennels, M.R. (1976). Cerebral symmetry: an urgent concern for education. Phi Delta Kappan, 57 (1), 471-472.

Rubenzer, R.L. (1982). Educating the other half: implications of left/right brain research. Washington, D.C: National Institute of Education. (ERIC Document Reproduction Service No. ED 224 268)

Salisbury, R. (1935). Some effects of training in outlining. English Journal, 24, 111-116.

Shepherd, James F. (1980). Reading skills for college study. Dallas, Texas: Houghton Mifflin, Co.

Tipps, Steve: Sanders, T.; Languis, M. (1982). Brain functioning models for learning. (ERIC Document Reproduction Service No. 212 373)

Torrance, E.P., Taggart, B. and Taggart W. (1984). Administrators manual: human information processing survey. Bensenville, Ill: Scholastic Testing Service, Inc.

Torrance, E.P., Taggart, B., and Taggart W. (1984). Strategy and tactics profile: human information processing survey. Bensenville, Ill: Scholastic Testing Service, Inc.

Using your creative brain. (1984). (Filmstrip) LC-84-73018. Stamford, Conn: Educational Dimensions Corporation.

VanDalen, Deobold B. (1979). Understanding educational research. New York: McGraw-Hill Book Company.

Vaughn, Joseph L. (1984). Concept Structuring: the technique and empirical evidence. In C.D. Holley and D. F. Dansereau (Eds.), Spatial learning strategies: techniques, applications and related issues. New York: Academic Press.

Vaughn, Joseph L. Jr. and Others. (1978). Construction of ideational scaffolding during reading. Petersburg Beach, Florida: Paper-Annual Meeting of National Reading Convention. (ERIC Document Reproduction Service No. ED 165 109)

Wittrock, M.C. (1974). Learning as a generative process. Educational Psychologist, 11, 87-95.

Wittrock, M.C. (1981). Educational implications of recent brain research. Educational Leadership, 39, 12-15.

Wittrock, M.C. (1982). Three studies of generative reading comprehension. In Jerome A. Niles and Larry A. Harris (Eds.) New inquiries in reading research and instruction. Thirty-first Yearbook of the National Reading Conference, The National Reading Conference, Inc., 85-88.